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Moving on in Neolithic studies

Moving on in Neolithic studies: Understanding mobile lives

Neolithic Studies Group Seminar Papers 14

Edited by

Jim Leary and Thomas Kador

Paperback Edition: ISBN 978-1-78570-176-4
Digital Edition: ISBN 978-1-78570-177-1

Oxford & Philadelphia
www.oxbowbooks.com

Published in the United Kingdom in 2016 by
OXBOW BOOKS
10 Hythe Bridge Street, Oxford OX1 2EW

and in the United States by
OXBOW BOOKS
1950 Lawrence Road, Havertown, PA 19083

Paperback Edition: ISBN 978-1-78570-176-4
Digital Edition: ISBN 978-1-78570-177-1

A CIP record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

Names: Leary, Jim, editor. | Kador, Thomas.
Title: Moving on in Neolithic studies : understanding mobile lives / edited by Jim Leary and Thomas Kador.
Description: Oxford ; Philadelphia : Oxbow Books, 2016. | Series: Neolithic studies group seminar papers ; 14 | Includes bibliographical references.
Identifiers: LCCN 2015051023| ISBN 9781785701764 (pbk.) | ISBN 9781785701771 (digital edition)
Subjects: LCSH: Neolithic period. | Nomadic peoples. | Migration, Internal. | Human beings--Migrations.
Classification: LCC GN775 .M68 2016 | DDC 930.1/4--dc23 LC record available at http://lccn.loc.gov/2015051023

Printed in the United Kingdom by Hobbs the printers

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Front cover image by Jim Leary

Foreword

This book presents the proceedings of a seminar held under the aegis of the Neolithic Studies Group (NSG), one of an ongoing series of NSG Seminar Papers. The NSG is an informal organization comprising archaeologists with an interest in Neolithic archaeology. It was established in 1984 and has a large membership based mainly in the UK and Ireland, but including workers from the nations of the European Atlantic seaboard. The annual programme typically includes a seminar in London during the autumn and, in spring-time, a field meeting in an area of northwest Europe known to be rich in Neolithic remains.

Membership is open to anyone with an active involvement in the Neolithic of Europe. The present membership includes academic staff and students, museum staff, archaeologists from government institutions, units, trusts, and those with an amateur or avocational interest. There are no membership procedure or application forms, and members are those on the current mailing list. Anyone can be added to the list at any time, the only membership rule being that the names of those who do not attend four consecutive meetings are removed from the list (in the absence of apologies for absence or a request to remain on the list).

The Group relies on the enthusiasm of its members to organize its annual meetings; the two coordinators maintain the mailing lists and finances. Financial support for the Group is drawn from a small fee payable for attendance of each meeting.

Anyone wishing to contact the Group and obtain information about forthcoming meetings should contact the coordinators or visit the NSG website at:
http://www.neolithic.org.uk/

Timothy Darvill and Kenneth Brophy
NSG Coordinators

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Preface and acknowledgements

Mobility is a fundamental facet of being human and should be central to archaeology. Yet mobility itself and the role it plays in the production of social life, is rarely considered as a subject in its own right. This is particularly so with discussions of the Neolithic people where mobility is often framed as being somewhere between a sedentary existence and nomadic movements.

This volume examines the importance and complexities of movement and mobility, whether on land or water, in the Neolithic period. It uses movement in its widest sense, ranging from everyday mobilities – the routines and rhythms of daily life – to proscribed mobility, such as movement in and around monuments, and occasional and large-scale movements and migrations around the continent and across seas. Papers are roughly grouped and focus on 'mobility and the landscape', 'monuments and mobility', 'travelling by water', and 'materials and mobility'. Through these themes the volume considers the movement of people, ideas, animals, objects, and information, and uses a wide range of archaeological evidence from isotope analysis; artefact studies; lithic scatters and assemblage diversity.

This volume originated from, and represents the proceedings of, the Neolithic Studies Group conference in 2012, organized by Jim Leary and entitled 'Movement and mobility in the Neolithic'. Jim Leary would like to thank Tim Darvill and Kenny Brophy, the NSG Coordinators, as well as the British Museum, in particular Gill Varndell from the Department of Prehistoric and Roman Antiquities, for allowing and facilitating the smooth running of the conference. The editors would like to thank Julie Gardiner at Oxbow for help and assistance in getting this volume into print.

Jim Leary and Thomas Kador
February 2015

List of Contributors

Umberto Albarella
Department of Archaeology
University of Sheffield
Northgate House
West Street
Sheffield
S1 4ET
England
United Kingdom

Penny Bickle
Department of Archaeology
University of York
The King's Manor
YORK
Y01 7EP
England
United Kingdom

Clive Jonathon Bond
Department of Archaeology
Faculty of Humanities and Social Sciences
The University of Winchester
Winchester
SO22 4NR
England
United Kingdom

Benjamin Chan
Department of Archaeology
University of Leiden
Van Steenis Building
Einsteinweg 2
2333 CC Leiden
The Netherlands

Angela Gannon
Royal Commission on the Ancient and
Historical Monuments of Scotland
(RCAHMS)
John Sinclair House
16 Bernard Terrace
Edinburgh
EH8 9NX
Scotland
United Kingdom

Fiona Haughey
Director Archaeology on the Thames Project
27 Spring Grove
Strand-on-the-Grove
London
W4 3NH
England
United Kingdom

Rob Ixer
Institute of Archaeology
University College London
31–34 Gordon Square
London
WC1H 0PY
England
United Kingdom

Thomas Kador
Public & Cultural Engagement (PACE)
University College London
Gower Street
London
WC1E 6BT
England
United Kingdom

Jim Leary
Department of Archaeology
School of Archaeology, Geography and
Environmental Science (SAGES)
University of Reading
Whiteknights
Reading
RG6 6AB
England
United Kingdom

Jonathan Last
Historic England
Fort Cumberland
Fort Cumberland Road
Eastney
Portsmouth
PO4 9LD
England
United Kingdom

Roy Loveday
School of Archaeology and Ancient History
University of Leicester
University Road
Leicester
LE1 7RH
England
United Kingdom

Sam Moore
Applied Archaeology
School of Science
Institute of Technology, Sligo
Ash Lane
Sligo
Ireland

Mike Parker Pearson
Institute of Archaeology
University College London
31–34 Gordon Square
London
WC1H 0PY
England
United Kingdom

Alice Rogers
Department of Archaeology
School of Archaeology, Geography and
Environmental Science (SAGES)
University of Reading
Whiteknights
Reading
RG6 6AB
England
United Kingdom

Sarah Viner
Department of Archaeology
University of Sheffield
Northgate House
West Street
Sheffield
S1 4ET
England
United Kingdom

Varied mobility in the Neolithic: The *Linearbandkeramik* on the move

Penny Bickle

Over recent decades, archaeology has seen an increase in the number of techniques available that shed light on past mobility patterns, with aDNA and isotopic studies coming to dominate the discussion, purporting to more directly reveal human or animal movement (Price *et al.* 2001; Haak *et al.* 2005). While both techniques provide information of unquestionable detail and insight, and have brought renewed energy to our engagement with certain historical phenomena, neither technique is a neutral reflection of mobility as the data they produce arose in social practices. This should excite us – such analyses provide additional routes into the complexity of prehistoric life – but they will only do so if the tendency to reduce to neatly bounded and exclusive models is resisted. As movement has become a short-hand for investigating thematic issues pertinent to studying the Mesolithic-Neolithic transition and different subsistence modes, potential variation in mobility strategies have been overlooked. This contribution argues, to the contrary, that diverse mobility strategies would have impacted significantly on the social worlds and networks across the Neolithic (Leary 2014; see Chapter 1). Subject to contingency, multi-scalar and often age and sex dependent, movement varies from day to day and across the life-time. Human movement can be considered one of the senses through which the world is encountered; Ingold (2004, 330–1) argues, in the case of walking, that it is a haptic experience; a way of touching, seeing and hearing through the feet.

In the context of the transition to agriculture and the spread of the Neolithic, considering patterns of human mobility is hardly a new discussion. Although the various models proposed are far from straight-forward, they often rely on a contrast of the movement forms practised by farmers to those of hunter-gatherers. While we may wish to question such polarised distinctions based on solely subsistence modes (Robb & Miracle 2007), it is important to recognise just how ingrained certain characterisations of mobility are in defining the Mesolithic-Neolithic transition. Particular types of movement thus often lie at the heart of explanatory mechanisms of how the Neolithic spread; whether it is the large-scale movements of demic diffusion and migration (Ammerman & Cavalli-Sforza 1984; Vencl 1986), the repeated crossing of frontier zones in availability models (Zvelebil 1996; 2000) or the inherent mobility of hunter-gatherers in arguments for autochthonous adoption (Whittle 1996; Jeunesse 2003a). Resultantly, evidence for different types of movement is not only sought to inform on the extent to which the Neolithic transition has taken place, but also to simultaneously provide information about how the transition

took place. Human movement has therefore been investigated both as a passive reflection of human groups' subsistence base as well as a key conduit for social change. As a result, particular mobility patterns have come to characterise certain ways of life at the transition; they are a symptom of a particular lifeway rather than being entangled in the formation of that lifeway.

One of the ways to move past these contradictions and unravel to complex relationship between diet, subsistence and mobility is to consider multiple scales of mobility and begin to tease out instances of variation. Taking the *Linearbandkeramik* (LBK; *c.*5500–4900 cal BC) as a case study, this contribution discusses the evidence for varied LBK mobility in two settings; the beginnings and spread of the LBK, and its social networks and descent practices. To be explicit, the aim here is not to assess where current evidence situates the LBK dispersal on the axis between colonisation and indigenous adoption, but rather to illustrate how variability in movement has the potential to further our understanding of perennial themes of cultural transmission and Neolithic daily life.

MOBILITY AT THE BEGINNING AND IN THE SPREAD OF THE LBK

It is unlikely that the LBK saw a straightforward expansion out of south-east Europe. At some point in the centuries around 5500 cal BC, the LBK arose in Transdanubia, Lower Austria and possibly also western Slovakia (*e.g.* Bánffy 2004). This way of life then spread out across the central European continent, eventually stretching from the Ukraine to the Paris Basin as the sixth millennium comes to an end. About 5300 cal BC, however, the nature of the culture changed; broadly, regionality was more recognisable across different material culture forms and usage, cemeteries began and, on a smaller scale, some sites are abandoned or relocated nearby (Cladders & Stäuble 2003). However, there are indications that not all groups adopted the newer styles at the same time, and some communities may have lagged behind their neighbours (Schade-Lindig & Schade 2010). The distributions of the so-called hunter-gatherer pottery traditions, such as La Hoguette and Limburg ceramic ware, suggest that things were not the same everywhere at this time and regionally specific histories can be envisioned. For example, Daniela Hofmann and Joachim Pechtl (Pechtl 2009; Hofmann *et al.* 2013, 211) see little contribution from an indigenous population to the regional variations found in Bavaria. Allard (2007) argues that there was more continuity in lithic technology between the first Rubané (LBK) groups in the Paris Basin and those from the neighbouring Rhine-Meuse regions than found between the Final Mesolithic of northern France and the LBK. Other researchers, in contrast, have focused on continuity, for example, suggesting that the burial evidence demonstrates a sustained importance of a Mesolithic or indigenous identity (Lenneis 2007; see Mateiciucová 2008 for arguments in favour of continuity between the Mesolithic and Neolithic lithic assemblages). Jeunesse (1997) argues that the variation in the burial practices of the Alsatian LBK (*e.g.* in body position and grave orientation) originated in the maintenance of a pre- or non-LBK identity by indigenous groups incorporated into the LBK.

Looking back to the beginning of the LBK, three models exist for its origins. As summarised by Mateiciucová (2008, 33) they are: (1) the LBK arises within the framework

of the Starčevo complex as it arrived further northwards, with little or no input from local groups, (2) the LBK was inspired by the mixing and meeting of Mesolithic communities with incoming farmers to their south, and (3) the development of an LBK way of life was entirely brought about by the indigenous population but caused by their contact and exchange with the Starčevo cultural base (and Körös culture in the case of the Alföld-LBK in eastern Hungary). Oross and Bánffy (2009) have recently proposed a more refined perspective, identifying a 'formative' phase for the LBK congruent with a period of overlap with the Starčevo culture, located in and around the marshy landscape of Lake Balaton and taking place over four to five generations before the LBK spread through Europe. In this region Kalicz (1988) had previously suggested a concentration of earliest LBK sites, which has been borne out by recent excavation in Transdanubia (Bánffy & Oross 2010). Recent analysis comparing the radiocarbon dates from the early LBK sites with those from Starčevo contexts suggest an overlap of at least a century between the early LBK and Starčevo cultures (Bánffy & Oross 2010), though this is based on a growing but limited number of radiocarbon dates (Stadler & Kotova 2013, 265). Oross and Bánffy (2009, 177) suggest a frontier zone around Lake Balaton, where the landscape was largely unsuitable for the horticulture found in south-east Europe, and argue that the "fully sedentary, food-producing" subsistence mode only came later in the history of the LBK.

The discovery of evidence for the earliest LBK at Brunn am Gebirge, in the form of pottery of similar style to that from the Lake Balaton area (Lenneis & Lüning 2001, 7; Lenneis 2010a), suggests that the area over which the earliest LBK was established could have been quite large. Brunn is located on the southern outskirts of modern-day Vienna; over 150km to the north-west of Lake Balaton sites (Stadler & Kotova 2013, 262). Radiocarbon dates, produced on charcoal, fall over a century earlier than the oft quoted 5500 cal BC start date for the LBK (Lenneis & Stadler 2010; Stadler 2005; Stadler & Kotova 2010; 2013). The 'old wood effect' is likely to play a role, as the dates were carried out on charred oak (Stadler & Kotova 2013, 264), but the arguments for direct connections to Starčevo groups further south based on the striking elements of the pottery decoration locates Brunn early in the development of the sequence. In the oldest parts of this site (Brunn IIa) typical LBK decorations are absent, with the pottery comparable to Starčevo (Linear B phase) ware found in Croatia and southern Transdanubia (Stadler 2005, 270; Stadler and Kotova 2010, 345; 2013, 263, 271). On this basis, Stadler and Kotova (2013) suggest that the inhabitants of this site represent a possible mixture of Starčevo groups migrating from the south and local hunter-gatherers; a permanent and uni-directional move to establish a settled community, which then attracts local hunter-gatherers. Other early or formative forays north can also be suggested. The earliest reliable radiocarbon date belonging to the western LBK sequence is from Schwanfeld (near the Main river, Bavaria), from an articulating male adult skeleton (Hd-14219, 6580 ± 20 BP; Gronenborn 1999, 155) calibrating to 5606–5483 cal BC (*95.4% probable*; OxCal 4.2; Bronk Ramsey 2009). The dendrochronological date from the well at Mohelnice (Moravia) is *c.*5460 ± 5 den BC (Schmidt & Gruhe 2003) may yet be another example. Such examples of 'leap-frog' colonisation thus took place alongside the more intense interaction suggested by Bánffy's (2004) proposed frontier zone around Lake Balaton.

However, as Stadler and Kotova (2010; 2013) emphasise for Brunn, the connections between the *älteste* LBK and the Balaton region remained strong. The lithics from Brunn are dominated by the Bakony mountain-sourced Szentgál radiolarite seen at sites around Lake Balaton (Stadler & Kotova 2013, 262). This is also a characteristic common in other early LBK assemblages from Lower Austria, where this raw material is often present in a higher frequency than those from local sources (Mateiciucová 2008, 59). Szentgál radiolarite had been known about and used since the late Mesolithic in Transdanubia and Moravia, found its way to late Starčevo groups (Kalicz *et al.* 1998; Bánffy 2004, 345–7) and travelled in decreasing amounts through Austria and Moravia into Germany with the *älteste* and *ältere* LBK (Gronenborn 1999; Bánffy 2004; Mateiciucová 2008). Thus while the sites around Lake Balaton may have provided an area of concentrated communication between settled farmers and foragers, sites further north and west, such as Brunn, seem to have been brought about by a different form of movement altogether. This suggests that major patterns of north-westward movement belie several degrees of distances covered, from places of intensive small-scale mobility to more extended patterns of travelling longer distances perhaps along the major river ways (*cf.* Pechtl 2009), though for the time being evidence for movement by water such as paddles and canoes are limited to the Mesolithic, exemplified by the coracle found near Keszthely on Lake Balaton (Bánffy 2004, 350, 354).

This broad picture of variability from the beginning of the LBK is thought not to be substantiated by current aDNA work. In summary, the haplogroups found co-occurring in LBK datasets (*e.g.* N1a, T2, J, K, V and HK; Haak *et al.* 2010) show little cross-over with those from the Mesolithic population (U4, U5 and U8; Bramanti *et al.* 2009). A substantial interdisciplinary project is underway to assess the transition from the perspective of mitochondrial aDNA by concentrating on the human remains from Transdanubia (Szécsényi-Nagy *et al.* 2014a; 2014b) and there seem to be early indications from this study that the maternal LBK gene-pool was directly linked to that of the Starčevo culture. Currently, therefore, at a brief glance the aDNA work strongly suggests that population migration spread the LBK, with only rarer contributions from indigenous Mesolithic groups. However, there are two concerns I would like to raise with the ways the growing aDNA dataset has been equated with straightforward population migration. The first problem is the chronological spread of the samples. Excluding the more recently analysed Hungarian material, of the 12 sites where aDNA has been carried out only the site of Vedrovice can be argued to belong to the first phase of the LBK (Pettitt & Hedges 2008). The rest (*e.g.* Haak *et al.* 2010) belong to the developed or *jüngere* phase, with some burials dating towards the end of the LBK (*e.g.* Schwetzingen, Baden-Württemberg and Asparn, Lower Austria). Population dynamics throughout the course of the LBK are thus also relevant to interpreting the aDNA evidence (Deguilloux *et al.* 2012; *cf.* Brandt *et al.* 2013), after all the LBK was hardly a static phenomenon (Bocquet-Appel 2014). Can we really be sure that the aDNA (limited at the moment to the mitochondrial lineages) is able to distinguish between migration at the beginning of the LBK, without being influenced by population changes and/or replacement during the following centuries?

Furthermore, at Karsdorf (*c.*5200–5070 cal BC, Mittelelbe-Saale region, Saxony-Anhalt) eight per cent of the haplogroups represented at the site are identified as 'hunter-gatherer' (U5a and U5b) – that is, as representing continuity from pre-LBK communities – while

other contemporary sites from the same region (*e.g.* Derenburg) have produced little or no evidence of a possibly indigenous contribution (Brandt *et al.* 2014). Thus the second concern relates to regionality and hence to scale. Excluding recent studies of the Hungarian assemblage, aDNA studies are currently dominated by sites in the Mittelelbe-Saale region of Saxony-Anhalt. Migration has the preferred explanation for the arrival of the LBK in this area. The presence of clay alters of the form found in the Starčevo at the älteste site of Eitzum (Lower Saxony) is often cited as evidence of direct links to the south-east, though a late Mesolithic population was surely present in the region (Kaufmann 1989; Gronenborn 1998). Given our growing understanding of varied regional histories in the LBK, surely now is the time to explore a broader range of regions. Other smaller assemblages are identified as 'southern' LBK (Asparn and Vedrovice) or 'south-western' Germany, combining the sites of Schwetzingen, Flomborn and Vaihingen an der Enz (*e.g.* Haak *et al.* 2010). Schwetzingen and Flomborn belong to regional groups centred on the Rhine (Jeunesse *et al.* 2009), leaving the one burial sequenced from Vaihingen (with a rare haplogroup of U3; Haak *et al.* 2005) as the only data point from a region rich in Final Mesolithic evidence (*e.g.* Kind 1998).

Complex regional histories in the spread and propagation of the LBK are likely to be relevant to the genetic make-up of populations. Pechtl (2009) has suggested that the LBK arrived into Bavaria from central Germany, and then eastwards along the Danube, with varied regional differences in style and pace of change which persist into the later LBK phases developing. The stylistic differences between north and south Alsace may also have arisen in groups migrating from different areas of the LBK (the Neckar valley and along the Danube), something which may go some way to explain that differences between the north and south of this region are often stronger than elsewhere (Lefranc 2007). Similar complex and multiple migration origins have also been proposed for Poland, through Moravia, Bohemia and possible even evidence of a trans-Carpathian route out of Slovakia, with continuous migration throughout the LBK into the Kuyavia region of central Poland envisaged (Czerniak 1994). Diverse regional histories, however, share broad patterns of settlement, with the low site density of the earliest LBK gradually replaced by the in-filling of clusters of settlements, within which some sites could be large and occupied for several centuries, while other smaller hamlets were perhaps only used for a couple of generations by one or two household groups before the descendants moved elsewhere (Claßen 2009, 98).

Therefore, the spread northwards from Transdanubia communicates something more fundamental about how these early farming groups approached their locales; not so much of migration and colonisation but of addition. Whether moving out or multiplying in the same region, the challenge is how we tease out the different mobility practices that were embedded in LBK ways of life and the individual histories of different regional trajectories. Taking this line of thought, the consistency of the ecological niches sought out by the LBK becomes understandable – in moving into new regions, places where the commitment to this way of life could be continued were actively sought (Barrett 2014). The settlement patterns and their spread would thus be just one of the forms and scales of movement rooted in LBK life, even if it was a necessary part of how the culture was practised. Hence, migration and colonisation are not unhelpful lines to think along when considering the spread of the LBK as both movement types are, at their core, about the process of identity maintenance during Diasporas. Themes of ancestral homelands, both real and imagined (Bradley 2001),

transmission and preservation of social ties and practice (Strien 2000; Sommer 2001; Frirdich 2005; Claßen 2005; 2009), the impact of forced or voluntary movement (Price *et al.* 2001; Bentley 2013), and the risk of 'pioneering' in new regions (Bogucki 1995, 94) all remain relevant to thinking through the LBK spread. However, the questions they inspire are far more pertinent to the detail of the archaeology and the regional variation found with the LBK; why did some settlements grow and others not? What forms of social organisation held settlement clusters together? In what ways did distance matter? What kept regional patterns alive? On what scale were social ties maintained?

EVERYDAY MOBILITY

If, on the scale of settlement, establishing new sites or moving into previously unoccupied regions was an important element of LBK movement, what about the individual mobility histories of LBK people? Not everyone would have been part of migrations into a new area, but this does not preclude the possibility that subsequent group or individual movements of some distance may have been made across the LBK. From the material culture, lithics suggest that at least some far ranging human movement was possible; Szentgál radiolarite reaches the Rhine – over 700km from the Bákony Mountains – though in limited numbers, while Krakow Jurassic silicate dominates the lithic assemblages in northern Poland, some 300–350km further north from its source (Mateiciucová 2008, 160). Raw material used to produce polished stone adzes could travel similar distances (Ramminger 2007; 2009). Pottery styles can also be found some distance from their region of origin. An Alföld-style pot was found at Leonding in Upper Austria over 400km away from eastern Hungary, the region to which this style was largely restricted (Grömer 2001, 17), while a number of different regional styles from the north (Rhine-Main) and east (Elbe) were represented at the Herxheim enclosure in the Rhineland-Palatinate (Turck *et al.* 2012). At the cemetery of Aiterhofen, Bavaria, two individuals were buried with pottery decorated in styles found in Baden-Württemberg and central Germany (Strien 2010, 499) and other such examples can be noted elsewhere as well (*e.g.* Strien 2000, 53). Pottery is unlikely to travel well and it remains to be seen whether it is the style or the ceramic itself that moves. Spondylus shell, found mostly in graves, fashioned in to jewellery or other wearable items, is exotic to the LBK region and most probably travelled from the Adriatic coast (Zvelebil & Pettitt 2008, 201). T-shaped axes made from red deer antler, found at Schwetzingen, Baden-Württemberg, and Eisleben, Saxony-Anhalt, suggest connections northwards, to the Baltic and the list could go on further, with possible connections to southern France in the form of Cardial ware styles in LBK contexts (Bentley *et al.* 2013, 277). Such evidence speaks to long-range movement of a different form to migrations relating to the spread of the LBK.

Of course, determining how these objects travelled – whether, for example, pottery styles travelled in the minds of individual potters or Szentgál radiolarite was passed hand-to-hand – requires detailed contextual research (*e.g.* see Zimmermann 1995 on the exchange of finished lithic products). Isotope analysis, however, has sought to offer another perspective by focusing on the movement of individuals (*e.g.* Price *et al.* 2001), but determining long-distant movement has proved difficult. In a rare example, Richards *et al.*

(2008, 189) and Zvelebil and Pettitt (2008, 211) note an adult male from the Vedrovice cemetery whose sulphur isotope ratio suggests that he may have spent most of his life in a coastal location (most likely in south-eastern Europe) before moving to Moravia in the decade before his death. The nearest coast, the Adriatic, is approximately 400km away from the cemetery. Though rare, such long-distance travellers must surely populate our histories of the LBK (Gronenborn 2010). More recently, strontium isotopic analyses have come to dominate the modelling of LBK mobility, with important insights achieved. Through the work of Alex Bentley (*e.g.* Bentley *et al.* 2012), a model of patri- or virilocality has been proposed for the LBK, evidenced by greater mobility amongst the female population. Discussion of LBK descent patterns has also been opened up through this work with the identification of a correlation between certain isotopic ratios and burial with polished stone items in the case of adult males (Bentley *et al.* 2012; see discussion in Hedges *et al.* 2013, and Whittle & Bickle 2013). Corina Knipper (2009; 2011) has furthered understanding of everyday mobility by contributing more detailed understandings of the herding strategies employed during the LBK in the region of Baden-Württemberg, suggesting that small scale herds were kept close to the settlement.

These insights have come not only through the increased number of samples, but careful consideration of how the isotopic ratios arise in human and animal skeletons based on integrating the environmental, geological and soil conditions of LBK settlement with a recognition of the deeply cultural practices in which both mobility and diet arise. Strontium isotopes make their way into the body through diet (Bentley 2013), so what constitutes 'incoming' or 'non-local' strontium isotope ratios may well originate in different dietary practices – or, at the very least, diet will be an important factor (Bentley *et al.* 2012). This means isotope ratios arose in the complex interplay between the regional soil variability, how the landscape around settlements were used and dietary practices. In the case of the LBK, determining 'local' strontium isotope ratio ranges are complicated by the fact that settlements were overwhelmingly placed on a certain type of soil, the loess, which produces similar strontium isotope ratios across much of Europe – though there is some variation, such as in Moravia where the erosion of the more radiogenic granites from the Bohemian Massif raises the strontium isotope ratios (Richards *et al.* 2008; this was also seen to a lesser extent at Nieder-Mörlen, Hessen, Nehlich *et al.* 2009). Resultantly, mobility within the LBK context (*i.e.* people moving from one settlement or region to another across the LBK) is unlikely to be directly discernible in the strontium data.

This does not mean that strontium data is not a useful proxy for considering mobility (Bickle & Hofmann 2007; Pollard 2011), but it does require careful attention to what practices lie behind the formation of strontium isotope ratios. Considering the data relatively, that is comparing the ratios between individuals, has proved a useful avenue towards fully contextualising strontium isotope datasets with the archaeological evidence (Bentley 2013). Women from LBK cemeteries show greater variability of strontium ratios than men; to be exact, although men and women share a similar range of ratios, men cluster more strongly within the strontium isotope ratios expected for loess soils (Bentley *et al.* 2012; Hedges *et al.* 2013, 367–8). Various explanations for this pattern can be proposed, including differences in childhood diet between the sexes (because tooth enamel is sampled, which mineralises in childhood) and more residential movement for women. Childhood

differences in diet could be a possible explanation for some of the variation, with girls fed a higher proportion of food stuffs that have been sourced from non-loess soils, perhaps also related to different tasks (*e.g.* fed less meat and as a result consuming more plants grown in non-loess locales or eating more wild plants and game because they were engaged in tasks away from the settlement; see Knipper 2011, 338–42 for simulations of different contributions of non-loess sourced food to the diet). Furthermore, non-loess sites were clearly used in the LBK; such as the scatterings of pottery, or in some cases, burials found at cave sites in various different regions, though contextual evidence from the sites themselves for the kinds of practices that took place at them are often lacking (Bickle *et al.* 2013, 167).

However, models of patri- or virilocality were supported by the strontium isotope results from Aiterhofen, Bavaria (Bickle *et al.* 2011; Hofmann *et al.* 2013). At this cemetery site, two mixing-lines appear for the men, while the female strontium isotope ratios show no such patterning. A mixing-line represents strontium sourced from different geologies or diets (Montgomery *et al.* 2007). Hence, if a group was using two sources with different values (for example drinking water from one geology and animals feeding from different geology) the values from each individual would fall along a line between the two extreme values of these sources or 'end-members'. The male community buried at Aiterhofen had, in their childhoods, shared one loess-based end-member, but two further sources of food, one from the loess and one from a more radiogenic soil were being used (Bickle *et al.* 2011; Hofmann *et al.* 2013). This difference does not appear to have arisen in change in mobility over time (see discussion in Bickle *et al.* 2011). For these two mixing-lines to have appeared, therefore, the males buried at Aiterhofen are likely to have largely belonged to the same dietary groups in their childhoods as they did as adults, while the women who do not share such a distinct patterning, had less consistent dietary sources – perhaps indicating that they had not shared dietary sources in childhood and hence originated other settlements in the Aiterhofen area or further afield in the LBK (Bickle *et al.* 2011). Despite this pattern only being seen at Aiterhofen, wider evidence corroborates patrilocal practices. The aDNA data from both Karsdorf and Derenburg, demonstrate highly varied mitochondrial lineages, suggesting patrilocality (Brandt *et al.* 2014; Brown 2014, 169) and patterns of pot decoration styles, particularly the 'secondary motifs', have recurrently been interpreted as indicating exogamous practices (Claßen 2009, 100–1).

More recently, however, Bocquet-Appel *et al.* (2014) have criticised the notion that patrilocality was practiced exclusively, arguing that a bilinear model fits more closely with the modelling of the demography of the LBK population and site density, though the details of this analysis are yet to be published. This is worth noting because the strontium data is overwhelmingly gathered from cemetery burials, which may themselves have developed under changing kinship patterns. Cemeteries have a history with the LBK, beginning about the time of the start of the second or developed phase of the LBK. The range of grave goods found with men have a much more strongly sexed profile than those found with females, mainly because of the presence of flint and polished stone tools in male burials (Hedges *et al.* 2013, 378). While the empty spaces in graves may signal that there were as yet unknown organic grave goods we should note (Lenneis 2010b), cemeteries do seem to operate more strongly around patrilocal and, given the correlation between polished stone tools and loess-range strontium isotopic ratios, patrilineal practices (Jeunesse 2003b; Bentley *et al.* 2012; Whittle 2012; Whittle & Bickle 2013).

However, patrilineal practices could well have only been consistent for the second phase of the LBK, as the cemeteries sampled spread across approximately three centuries from *c.*5300–5000 cal BC (Whittle & Bickle 2013), and this may have been restricted to a particular section or group of LBK society. As is well known, cemeteries are absent in the regions of the Paris Basin, Hungary and Poland and, although men and women are equally frequently found in settlement burials (Hedges *et al.* 2013, 373), the all but absence of the most strongly male-associated grave goods such as polish stone could speak to other descent practices in these regions (Whittle 2012; Whittle & Bickle 2013). The strontium data for the Alföld region (Eastern Hungary) may support this as men dominate amongst the outliers, but the number of samples remains low (one female, three males from a total of 41 sexed adults analysed; Whittle *et al.* 2013). Other burial practices may also represent alternative forms of social relationships or kinship. For example, cremations, unavailable to strontium analysis, are also present on many cemeteries, grow more frequent towards the end of the LBK and account for approximately 10% of the burial record (Trautmann 2007, 11). Perhaps, as well as regional variation, we could also propose that different kinship systems were practised alongside each other and certainly demonstrate that burial was not a static social arena. Here, therefore, an inter-relationship between mobility and the forms of kinship and social relationships making up LBK life is envisaged of which women moving on marriage is just one of the possibilities (Whittle & Bickle 2013, 391).

CONCLUSIONS

To conclude, three arguments are being put forward here; first, that there is a need to see mobility patterns not as demonstrating particular dietary strategies for the LBK, but rather framed by social life, which could have incorporated kinship as much as food sourcing, second, that the mobility strategies in evidence need to be carefully assessed against the history of the LBK and third, that multiple forms of mobility were practiced in the LBK, at a range of scales. Diet and mobility were closely intertwined in prehistory, however, this should not mean limiting the forms of movement discussed to those defined by farming, herding or hunting. There is a tension between our explanatory faculties for interpreting the datasets that arise and how we use them to reflect critically on a wide-range of different types of evidence. With so many potential patterns of mobility at play across the life of the LBK, on many different scales, it is not enough to end with best fit models; other lives were lived.

ACKNOWLEDGEMENTS

I am greatly indebted to my colleagues on and the funders of *The First Farmers of Central Europe: Diversity in LBK Lifeways* (led by Professor Alasdair Whittle, AHRC UK) and gratitude is especially due to those who let us sample their collections. Many thanks to Alasdair Whittle, Alex Bentley and Daniela Hofmann for commenting on earlier drafts of the text, though of course, all mistakes remain my own.

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